c) Demolition – "Guidelines for Preparation of a Bridge Demolition and Removal Plan over the Union Pacific Railroad".

III UNITS

Grade Separation overhead structures that require use of metric units shall indicate all controlling dimensions in dual units. English units to be shown in parenthesis.

Controlling dimensions or elevations refer to but are not limited to the following:

a) Horizontal and vertical clearances.
b) Track spacing, Railroad right-of-way, track stationing.
c) Span length, width and depth of superstructure elements.
d) Size and limits for barrier rail or splashboards, and fences.
e) Location and elevation of underground or aerial utilities and their relocation adjustments if required.
f) Size, elevation and location of pier or abutment footings for spans adjacent to railroad tracks.
g) Size of structure supports (pier or abutment walls, columns).
h) Size and elevations of pier protection walls if required.
i) Shoring location and their limit if required.
j) Top of rail elevation under structure and grade profile.
k) Size and location of drainage structures and ditches.
l) Temporary construction vertical or horizontal clearances if required.

Plans shall be rejected if required controlling dimensions are not shown or not shown properly.

IV NEW OR MODIFIED STRUCTURES

New overhead structures are defined as any structure being constructed over the Railroad tracks at a location where no crossing currently exists or replace an existing at grade crossing. All new structures shall be designed to provide for one or more future tracks as required for long range planning or other Railroad operating requirements and additional room for an access roadway. Where provisions are made for more than two tracks, space is to be provided for access roads. Designer should consult with Manager of Industry and Public Projects first and or the Director of Project Design in Omaha for the track requirements at each location. The Manager of Industry and Public Projects should not be bypassed on any discussions. **The current issue of Union Pacific Railroad standard drawing 0035 indicates only minimum requirements.**

Modified existing structures are defined as those structures being modified or

replaced with a new structure. All modified structures shall comply with the applicable minimum requirements shown on the current issue of Union Pacific Railroad standard drawing **0035,** when the following modification to the structure is proposed:

STRUCTURE MODIFICATION	COMPLY WITH REQUIREMENTS FOR
Total deck replacement	Fence, Splashboards, Lighting, if applicable
Total replacement of existing railing	Fence, Splashboards
Total replacement of superstructure	Vertical clearances, Fence, Splashboards, Lighting, if applicable
Total replacement of existing structure	Treat replacement structure as **New** structure
Widening deck of existing superstructure	Fence, Splashboards, Lighting, if applicable
Widening existing structure	Provide Pier protection walls if required or modify existing walls to comply with current **AREMA** requirements
Multiple parallel structures	Treat each structure as an individual structure

V PERMANENT CLEARANCES

It is preferable on all new overhead bridge structures to have all piers and abutments located outside the Railroad's right-of-way and parallel to the tracks. Permanent clearances shall comply with current issue of drawing **0035,** with provisions for future tracks, access roads, and drainage ditches.

Any variation of horizontal or vertical clearances shall be treated as a special case and will require approval by the Chief Engineer Design.

A. VERTICAL CLEARANCES

Minimum permanent vertical clearance shall be twenty-three (23) ft. above the top of rail for **ALL** tracks and at any location under the structure. Additional vertical clearances may be required for features beyond those shown in the standard drawing; such as correction of sag in the track, track raise, construction

requirements, and future track raises (within the next five years).

Design plans shall prominently display a note stating: **"The elevations of the existing top-of-rail profile shall be verified prior to beginning construction.** All discrepancies shall be brought to the attention of the Chief Engineer Design and corrected prior to construction.

The minimum horizontal and vertical clearances as well as the existing clearances of structures to be rehabilitated or replaced shall be indicated on the General Plan and Elevation.

B. HORIZONTAL CLEARANCES

Layout of ALL overhead structures shall provide ample space for access roadway at least on one side of the track. For multiple tracks, space is to be provided for access roadway on both sides and in between tracks if required by the Service Unit Superintendent for servicing trains. Designer to consult with the Manager of Public Projects for the requirements and location of access roadway.

Minimum horizontal clearance on tracks without access road shall be eighteen (18) ft. to the face of pier protection wall, and twenty-five (25) ft. on tracks with access road. Horizontal clearances are for tangent tracks and correspond to the perpendicular distance from centerline of the track to the face of support or pier protection wall.

The layout of proposed structure shall take into consideration the following:

1. Future tracks and their relative location.

2. Spreading of tracks and direction of spread.

3. Location of access road.

4. Location and size of drainage ditches.

5. Location of existing or relocated utilities.

6. The minimum horizontal clearance requirement is for tangent track layout. Horizontal clearances shall be increased per **AREMA** requirements when any part of the structure is located within eighty (80) ft. section of curved track.

VI CONSTRUCTION CLEARANCES

A. VERTICAL CLEARANCE

The minimum **temporary construction** clearance to any falsework part shall be twenty-one (21) ft. vertically above the top of the highest rail. Falsework designers must check the supporting members for deflection and allow for said deflection, with a factor of safety, during erection of the falsework, construction, and the removal of falsework elements. **Dropping of falsework or any other construction material on the tracks is not permitted.**

B. HORIZONTAL CLEARANCE

The minimum **temporary construction** clearance to any falsework part shall be twelve (12) ft. from the centerline of the nearest track measured perpendicular to said track.

Temporary horizontal clearances shall be adjusted per **AREMA** requirements when structures are located within eighty (80) ft. of a curved track.

Greater clearances may be required for special cases to satisfy local operating conditions. Designer shall consult with the Manager of Industry and Public Projects for locations where additional clearance is required.

Temporary vertical and horizontal clearances shall be shown on the plans for all overhead structures.

No variation to any temporary clearances (vertical or horizontal) will be allowed without written authorization from the Chief Engineer Design.

VII SAFETY BARRIER AND SPLASHBOARDS

Designers of overhead structures shall provide means of protecting Railroad facilities and to maintain the safety of employees below the structure from snow removal activities and errant vehicles.

ALL structures where snow removal is being performed shall have splashboards as indicated in Union Pacific Railroad standard drawing **0035**. Structures requiring snow protective devices shall have a high solid barrier railing of 3'-6" minimum height or a combination of a lower solid barrier railing and splashboards on top for a total height of five (5) ft. For details see current issue of drawing **0035** and drawing **UP - OH1** Appendix B.

A variance to the solid 3'-6" high barrier railing or splashboards which is based on not removing snow laterally from the bridge will require a clause to that affect in the agreement between the Agency and the Railroad. **Final plans shall not be approved without copy of such agreement between the Agency and Railroad.**

The limits of snow protective devices shall extend to the full length of Railroad's right of way or a minimum of twenty-five (25) ft. beyond the centerline of exterior track or access road. Addition of future tracks shall require the lengthening of the snow protective devices at the expense of the agency.

Standard solid barrier rail will be acceptable on structures where snow removal is not performed.

Types of barrier railing or combination of barrier railing and splashboards and their limits on the structure shall be clearly shown on the plans.

VIII SAFETY FENCES

Designers of overhead structures shall provide means of protecting Railroad facilities and the safety of their employees below from objects being thrown from above by pedestrians or passing motorists.

Fence shall be provided on both sides of **ALL** overhead structures. For types of fences see current issue of standard Union Pacific Railroad drawing **0035** and drawing **UP - OH1** Appendix B.

Designer shall provide eight (8) ft. high curved fence or ten (10) ft. high straight fence on the side of walkway and a combination of barrier rail and fence of total height of ten (10) ft. on the side without walkway.

Keep in mind that the protection and safety of rail operations and the Union Pacific employees that may be working on the ground beneath the bridge is absolutely paramount. Any variance to fence requirement above shall not be granted unless the Manager of Industry and Public Projects consults with local Director of Track Maintenance (DTM) and his concurrence is submitted to the Manager of Structures Design with the plans for approval.

If variance is granted a clause in the Agreement between the Agency and the Railroad shall be included that the Agency shall provide for future installation of fencing at the Agency's expense if deemed necessary by the Railroad.

Aesthetics shall not be cause for not meeting the safety requirements.

The Chief Engineer Design will consider ornamental fencing with a maximum gap of four (4) inches and meeting the minimum height requirements above.

The limits of protective fence shall extend to the full length of Railroad's right of way or a minimum of twenty-five (25) ft. beyond the centerline of outermost track or access road. Any addition of future tracks shall require the lengthening of the safety fences at the expense of the agency.

Types of fences and their limits shall be shown on the plans.

IX PARALLEL STRUCTURES

Parallel structures which are up to two (2) ft. apart shall not require safety fence or snow protective devices at their interface. Structures which are more than two (2) ft. apart shall be treated as individual structures and the required safety protective devices (barrier, splashboards, and fences) shall be provided.

X PIERS

All piers and abutment slopes shall be located so that they do not interfere with the drainage ditches or the natural drainage features of the area. Where conditions make this impractical, an explanation of such conditions shall be submitted along with the drainage plans and supporting calculations to the Office of the Chief Engineer Design for approval.

Anticipated location of piers located within twenty-five (25) ft. from centerline of the nearest existing or future track shall be designed with pier protection wall. Footings shall be placed in such a location, where construction shoring will conform to CE 106613 minimum excavation distances.

Pier footings within twenty-five (25) ft. of the nearest track centerline shall be a minimum of six (6) ft. below base of rail. This will not restrict Railroad from modifying longitudinal drainage system in the future or from providing unobstructed area for placing, signal, fiber optic lines or other buried utilities.

Drilled shafts within the influence of track surcharge shall be designed with temporary casing to protect track against cave-in, subsidence and/or displacement of surrounding ground. Casing shall be designed for live load due to the railroad surcharge in addition to all other loads.

Drilling of shafts or shoring construction for footings within the influence of track surcharge shall not proceed without the approval from the Chief Engineer Design. For limits of track surcharge influence refer to Union Pacific Railroad Standard

Drawing **CE # 106613** "General Shoring Requirements" Appendix B.

XI PIER PROTECTION WALLS

Piers supporting bridges over railways and with a clear distance of less than twenty-five (25) ft. from centerline of nearest or centerline of anticipated future track shall be of heavy construction or shall be protected by a reinforced concrete protection wall.

Design of pier protection wall shall comply with the requirements of **AREMA** Chapter 8, Part 2 Section 2.1.5.1. See Commentary of this section on **AREMA** specifications and Figure C-1 for additional details.

In locations where tracks are on both sides of pier and are less than twenty-five (25) ft. from centerline of adjacent tracks both sides of the pier shall be protected with protection walls.

If pier design requires column isolation, the pier protection wall shall be designed to resist the impact and redirection of equipment in case of derailment, supported on an independent footing.

ALL replacement or modified structures shall comply with the **AREMA** requirement for pier protection walls.

In locations where pier columns and protection walls interfere with drainage, openings must be provided in the wall for the drainage to ditches or drainage facilities must be provided to collect and dispose water to the drainage system. Openings in the pier protection wall must be lower than the track subgrade elevation and must drain away from the track.

AREMA defines pier of heavy construction as: "Piers shall be considered of heavy construction if they have a cross-sectional area equal to or greater than that required for the pier protection wall and the larger of its dimensions is parallel to the track". For a single column the minimum cross-sectional area is 30 sq. ft. (12' length x 2.5' width = 30 sq. ft.). Columns with 30 square ft. area must have the larger dimension parallel to the track (such as 5' x 6' column with the 6' dimension parallel to the track is considered as heavy construction column). Round columns may not meet the heavy construction criteria.

XII ADJUSTMENT TO UTILITIES

Existing underground or aerial facilities interfering with new structure shall be placed underground and away from the bridge structure. Relocation of utilities shall be

performed by the owners of the utility at the sole expense of the Agency.

Relocation of non-railroad owned utilities or communication lines shall be coordinated with the owners and submitted to the Union Pacific Real Estate Department for handling.

Any Fiber Optic adjustments shall comply with current Union Pacific Railroad Fiber Optic Rules Construction and Engineering Standards Manual. For more information call 1-800-336-9193.

XIII ABUTMENT SLOPES

To prevent embankment material from sloughing and drainage waters from undermining track subgrade, end slopes of abutments adjacent to railroad tracks shall be protected with paved slopes.

Paved slopes shall extend two (2) ft. past the face of abutment wall and terminate with either a curb or gutter to divert runoff. Paving shall consist of a prepared sub-base and filter fabric with a minimum of four (4) inches thick reinforced concrete or grouted rip-rap placed on prepared sub-base and filter fabric. Asphalt pavement for slope protection shall be considered only if proper design and method of installation is submitted or covered in the special provisions.

Toe of slopes shall terminate at the bottom of drainage ditches and must have a cut-off wall as required to protect slope from drainage erosion.

Slope layout shall provide for a minimum drainage ditch or ditches required by hydraulic studies in the area. See drawing **UP – OH2** for details Appendix B. At all times the toe of slope shall be below the finished track or roadway subgrade and provide a ditch for positive track drainage.

If layout of abutments, piers, or columns with crash walls interfere with the drainage ditches, the designer shall provide other means of handling the longitudinal drainage issues based on the local drainage study.

Track drainage ditch limits shall be shown to scale on the project plans and show the distance from centerline of nearest track. A typical cross section detail shall be shown on the plans depicting the intersection of slope and drainage ditch.

XIV DRAINAGE AND EROSION CONTROL FROM STRUCTURE

Maintaining the existing drainage and providing for future drainage improvements is of the utmost importance in layout of overhead structures.

Drainage from structure shall be diverted away from the Railroad right-of-way at all times. Scuppers from deck shall not be permitted to discharge water onto the track or roadway areas at any time. If drainage of deck uses downspouts in the columns, then they shall be connected to the storm drain system or allowed to drain into drainage ditches. Concrete splash block or aggregate ditch lining will be required at the discharge area of downspouts. Downspouts shall be behind the face of the piers and their outflows drain into drainage ditches.

If structure drainage is carried outside the Railroad right-of-way and does not change the drainage conditions within the Railroad right-of-way then improvement of existing drainage will not be required.

If the proposed bridge structure will not change the quantity and/or characteristic of the flow in the railway's ditches and/or drainage structures; the plans shall include a general note stating so.

Drainage plans shall be included with the plan submitted for review. These plans must include hydrologic computations indicating the rainfall intensity and duration of the design storm used as well as the method of analysis. Drainage structures shall be designed for a 100-year flood event so that the water surface elevation does not exceed the track subgrade elevation. Where project design calls for the drainage flow to increase through the railroad right-of-way, methods must be developed to carry the additional flow.

Lateral clearances must provide sufficient space for construction of the required standard ditches parallel to the standard roadbed section.

When the proposed construction will change the quantity and/or characteristic of flow in the existing ditches, the ditches shall be modified as required to handle the increased runoff. The size of ditches will vary depending upon the flow and terrain and should be designed accordingly.

In order to evaluate the impact of the new structure relative to existing site drainage, cross sections perpendicular to the centerline of track shall be submitted along with the drainage plans. Cross sections should be submitted to adequately depict the site condition, however, a minimum of five (5) cross sections on each side of structure will be required at 50' intervals. The existing or proposed railroad ditch and the proposed toe of slope shall be shown on the applicable cross sections.